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CONTENTS

Weber—The stings of the harvesting ant 85

For a history of entomology 90

Muesebeck—New reared species of Lygocerus 91

Brown—Neotropical species of Strumigenys 97

Heinrich—Ichneumon canadensis, lectotype 104

DeLeon—Two new Typhlodromus (Acarina) 105

Scullen—Eucerceris simulatrix misspelled 108

Rehn—Further notes on the genus Gesonula 109

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The Stings of the Harvesting Ant, Pogonomyrmex occidentalis (Cresson), with a Note on Populations (Hymenoptera)

By NEAL A. WEBER, Swarthmore College, Swarthmore, Pennsylvania

The painful effects of the stings of the harvesting ants of the Western United States have been well known in a general way since the days of the Rev. H. C. McCook, who published an extensive account in 1879 (The natural history of the agricultural ant of Texas. Lippincott's Press, Philadelphia, 311 pp.). Specific records are less common and allergic reactions must always be considered in evaluating the results on any particular human being. Personal effects of the stings of an entirely different ant, *Paraponera clavata* Fabr., have been noted (Amer. J. Trop. Med., 1937, 17: 765–768; Science, 1939, 89, 127–128). There is no evidence at this or any time that I have been allergic to insect venom.

Reactions of the stings of *Pogonomyrmex occidentalis* on six people are given below and were determined from colonies taken at the confluence of the Cannonball and Missouri Rivers, North Dakota, on August 16, 1942. The ants were personally collected and one stung me at 11:05 A.M. on the knee, after climbing up under the trousers. It probably injected a full dose of venom.

A purplish spot was immediately noticed at the site of the sting, doubtless representing a local hemorrhage. A pale edema followed on an erythematous halo. Fifty minutes later, after having kept the knee largely immobilized while driving a

car, the edema was elliptical, 20 mm. in maximum diameter, and was in the center of an erythematous halo 37 mm. in diameter. Both disappeared by 1:30 P.M.

That afternoon four people, ages 22 to 28 years (three female, one male), volunteered to try the effects of the stings.

D. C. W. was stung at 2:28 P.M. on the medial surface of the left forearm 2–3 cm. from the wrist. The ant was allowed to sting several seconds. No edema developed by 2:41 but during this period she could feel the pain spreading. A faint erythema developed quickly which at 2:43 was 5 mm. in diameter and pinkish. At 2:58 the whole arm to the fingertips pained in a throbbing fashion and a maculate erythema extended 77 mm. to the base of thumb. At 3:02 wet baking soda (sodium bicarbonate) was placed on the erythema which cooled but did not stop the pain. At 3:09 she described her sensations as an intensely painful throbbing. By 3:35 the soda had dried and the sting "just plain hurts." During the night she felt the sting paining intermittently but by the following noon this had disappeared. A red spot marked the site of the edema.

B. B. C. was stung at 2:53 P.M. on the right third digit of the hand next to the cuticle at the base of the nail. At 2:56 the medial border of the distal joint became edematous and erythematous. It felt "very painful and hot." At 3:01 the entire finger pained and a maculate erythema had appeared over the dorsum. At 3:03 wet baking soda was applied and cooled the finger but the throbbing pain persisted. It was very painful at 3:09. At 3:12 the soda was washed off and concentrated household ammonia applied. This gave temporary relief but only when freshly applied. By 3:21 continuous dull pain to the axilla on the medial surface was felt. The circumference of the distal joint at 3:43 was 54 mm., at 4:00, 57 mm. and by the following noon 52 mm., the normal condition. The sting was described as "throbbing and paining very much" at 4 P.M. and at 9:40 as still paining. By the following noon there was no pain and no external indication of the sting.

M. W. was stung repeatedly on the skin opposite the medial aspect of the right gastrocnemius muscle towards the middle of

the leg at 3:06 P.M. The stinging apparatus finally stuck in the skin for two minutes and the ant could not remove it although free to do so. Consequently all available poison must have been injected. A flesh-colored edema 3 mm. in diameter had appeared by 3:12 on the tanned skin. Intermittent pain was felt during the interval. By 3:17 the edema had mostly disappeared. By 3:23 minute edemae had appeared where the stinging apparatus had momentarily pierced the skin and an erythematous halo had developed about all. At 3:33 an area with a diameter of 40 mm. was erythematous only at the bases of hairs but without edema. A "burning sensation" was apparent during the entire period and this became a sharper pain when the area was exposed freely to the air. At 9:20 P.M. the lesion was still paining and the erythematous halo was reported still visible. By noon of the following day an area 30 mm. in diameter was reported erythematous but pain had disappeared.

The reactions of A. M. C., the male and the fourth person, were comparable to those of the others.

The physiologist, Dr. R. V. Brown, later used some of the ants in an experiment on me. His observations follow:

"Five ants were allowed to sting the subject: the locations of the stings formed an approximate circle around the patella. The first sting was given after the following normals were determined: pulse 70, temperature 98.1°, blood pressure 106/76.

Each ant was allowed to sting for about one minute, so as to allow complete injection of its poison. The first ant was applied at 10:26 A.M. The last was removed at 10:33 A.M. Each sting was numbered. The circumference of the knee was 37 cms. at 10:35 A.M.

Diameter of the wheals at 10:38–40: #1—0.6 × 0.6 cm.; #2—0.5 × 0.4 cm.; #3—0.6 × 0.4 cm.; #4—0.6 × 0.8 cm.; #5—0.7 × 0.6 cm. (Two stings were given here, close together.)

The erythematous areas were confluent for all but #4; the area here was 3.0 × 3.5 cms. Diameter of erythematous area was 10.5 cms., measured from the outer edge of the area on #1 to the outer edge of #4.

Diameter of wheals at 10:50 A.M.: #1—2.1 × 1.1 cm.; #2—1.0 × 0.7 cm.; #3—1.4 × 0.8 cm.; #4—1.0 × 0.9 cm.; #5—1.1 × 1.0 cm.

Temperature at 10:50 A.M.—98.2°. At 10:59 A.M. the area of erythema surrounding the two stings of #5 began to sweat profusely. The pulse was 74. At 11:30 A.M. the erythematous area measured 12.0 cms. maximum diameter. By 11:45 A.M. all evidence of wheals had disappeared from all the stung regions except #5. At 12:06 P.M. the pulse was 74."

The circumference of the knee remained the same during an afternoon of moderate exercise. It remained feverish and painful, however, and seemed swollen at times. The following morning (7 A.M.) the circumference of the knee was 38 cm. and at 10:10 A.M. it was 39.8 cm. Twenty-four hours later it was normal.

Dr. Brown allowed one worker to sting him with the following notes as recorded by him:

"One sting on the anterior aspect of the arm, over the tendon of the biceps at 11:01 A.M.

11:03.5 Diameter of erythema—3.5 × 3.5 cms. Diameter of wheal—0.3 × 0.5 cm. (Minute blood-point at the point of entrance of the sting.)

11:16 Diameter of erythema—4.5 × 6.0 cms. Diameter of wheal—0.7 × 0.6 cm.

11:29 Diameter of erythema—5.0 × 5.0 cms.

11:45 Diameter of erythema—5.0 × 5.0 cms.; the wheal had disappeared.

The stung area remained red and painful all afternoon. The sensation was one of a dull throbbing ache, repeating the feeling of the original sting with diminished intensity; there was some slight itching."

It is clear from the reactions of the above six subjects that the sting of one ant is sufficient to cause a marked reaction, whose duration and magnitude depend on the site of stinging and the subject. It is also clear that multiple stings could cause a systemic reaction of some severity.

In a search of the world literature on stinging ants, numerous records have been found which show that various genera and species are involved. Holarctic major genera include *Myrmica* and *Manica,* cosmopolitan genera include particularly *Solenopsis,* pantropical genera are *Leptogenys* and *Odontomachus,* Tropical Asia and Africa have *Tetraponera* and *Dorylus* and Africa has also *Megaponera.* The Neotropical Region has *Eciton, Paraponera, Neoponera* and *Pseudomyrmex.* Australia is noted for its *Myrmecia.* It has been my experience to be stung by all of these.

A Note on *Pogonomyrmex* Populations

The agricultural and general importance of the species of *Pogonomyrmex* in the Western United States have caused them to be the subject of numerous studies and the present monographic treatment by Dr. A. C. Cole. The population of a colony of *barbatus* had been found to be 12,358 adults by Wildermuth and Davis (1931, U.S.D.A. Farmers Bull. 1668).

The nests are sufficiently prominent on the western plains that they may easily be seen from the propeller-type airplanes that are now passing out of the long distance transportation picture. On a flight south from Salt Lake City, Utah, towards Los Angeles on February 17, 1946, the ground, lightly dusted with snow, appeared in places pock-marked by the ant nests. The nests had in previous years been noted from the ground in the same regions and determined as *Pogonomyrmex,* probably *occidentalis.* From something like 5000 feet above the ground the nests appeared in the early morning sunlight as small, dark spots near the centers of many of the bare clearings in the vegetation. Roads laid out on section lines, thereby forming grids of one square mile, were also conspicuous. From the airplane the nests along a mile of road could be seen and at a glance the general distribution of the nests in the square mile could be determined. Over several square miles, particularly between Salt Lake City and Sevier Lake, the nest clearings were from two to five diameters distant from one another. Previous ob-

servations from the ground had shown the clearings to be of the order of magnitude of five feet in diameter. Where the nests were fairly uniformly distributed over the square mile, the count of nests along one side was all that was necessary to estimate the numbers of nest in the square mile. Squaring the count would give a rough approximation of this number. The highest concentration was on level or rolling sagebrush flats and somewhat less on gentle slopes at the bases of small mountain masses. The nests were often abundant down to the southwest corner of Utah.

From these rough data, if each nest clearing was about five feet in diameter and 25 feet apart there would be a nest every 30 feet or 176 to the mile. Were the square mile to be evenly populated, there would be more than 30,000 nests (30,976) and, at a conservative figure of 10,000 adults to the nest, a population of at least 300 million ants. It would seem inescapable that these ants would be the dominant animal in such areas.

For a History of Entomology

Professor J. J. DAVIS is interested in compiling a History of Entomology and in particular, at the present time, a history of amateur insect clubs which flourished seventy-five years ago. Will you who have knowledge of early insect clubs or societies please advise Professor Davis, giving such facts as time of existence, members, etc., which you may have. Address: Dr. J. J. Davis, Department of Entomology, Purdue University, Lafayette, Indiana.

New Reared Species of Lygocerus Foerster (Hymenoptera: Ceraphronidae)

By C. F. W. Muesebeck, United States National Museum

Species of *Lygocerus* are most commonly associated with sternorrhynchous Homoptera, especially aphids and mealybugs, and to a lesser extent chermids and psyllids. They develop either as hyperparasites through other Hymenoptera that are primary, or as parasites of predatory larvae such as those of Syrphidae (various genera) and Chamaemyiidae (especially *Leucopis* and *Cremanifania*). Other recorded hosts include Coniopterygidae and species of the dipterous genera *Phytophaga* and *Meromyza*.

Although specimens have been reared abundantly the Nearctic species have never been critically studied taxonomically. Apparently most of them are undescribed. Five species for which names are desired are described here. Two of these were reared from *Leucopis*, two as hyperparasites of aphids and one from a hemerobiid.

Lygocerus leucopidis, new species

In some respects this is very similar to *pacificus* Ashmead but it is immediately distinguished by the relatively short scape of the female antenna which does not nearly attain the vertex of the head, whereas the scape of female *pacificus* extends conspicuously above the vertex. It differs further in the stouter antennal flagellum, and in having the petiole of the abdomen closely, longitudinally striate. In *pacificus* the petiole is nearly smooth, with only a few weak striae.

Female.—Length 1.5 to 2 mm. Head seen from above twice as broad as long; frons gently convex and at its narrowest point narrower than eye height, strongly shagreened and dull; width of temple at narrowest point less than length of antennal pedicel; first segment of antennal flagellum a little longer than pedicel and much less than half as long as scape; at least some of the flagellar segments less than twice as long as broad; vertex

sculptured like frons; ocellocular line at least one and one-half times the diameter of an ocellus.

Thorax stout, slightly narrower than head; mesoscutum nearly or quite twice as broad as long and, together with scutellum, sculptured like frons and vertex; notaulices and median furrow of mesoscutum complete and sharply impressed; mesopleuron coriaceous and dull.

Abdomen at widest point slightly wider than thorax; petiole of abdomen coarsely, longitudinally striate, the middle striae more than half as long as scutellum.

Black; basal half of scape and, in the larger specimens, all legs reddish yellow, with the hind coxae, femora and tibiae more or less piceous or blackish; in the small specimens the legs more extensively black; anterior wing hyaline with a fuscous cloud below stigmal vein.

Male.—Differs from the female in its broader frons, clear hyaline wings and very different antennae, which are as illustrated.

Type.—U. S. National Museum No. 64574.

Type-locality.—Albany, CALIFORNIA.

Described from 11 females and 12 males reared by Fred D. Bennett from purparia of *Leucopis* sp. in June and July, 1958. The host larvae were preying on aphids living on *Cotoneaster, Pyracantha* and *Salix.*

Lygocerus pinicola, new species

This is rather similar to *leucopidis,* but it may be readily distinguished from that species by its more slender form, and especially by its much narrower head.

Female.—Length 1.5 to 2 mm. Head relatively long and narrow, much less than twice as wide as long viewed from above; frons evenly convex, and at narrowest point distinctly narrower than eye height; frons and vertex strongly shagreened and subopaque; ocellocular line barely longer than longest diameter of an ocellus; scape attaining level of vertex; first flagellar segment about one-third as long as scape; flagellar segments 2 to 8

shorter, less than twice as long as broad; width of temple at narrowest point less than length of antennal pedicel.

Mesoscutum only a little broader than long, sculptured like the head, and with sharp, complete notaulices and a narrow but sharply impressed median groove; scutellum and mesopleuron sculptured like mesoscutum. Abdomen not wider than thorax, the petiole coarsely, longitudinally striate.

Black; antenna, including scape, entirely black; anterior wing hyaline with a very faint cloud below radius; legs piceous to black, the anterior pair sometimes brownish yellow in front.

Male.—Like the female except that the wings are entirely clear hyaline, the frons is relatively broader, and the basal flagellar segments are deeply serrate as illustrated.

Type.—U. S. National Museum No. 64575.

Type-locality.—Berkeley, CALIFORNIA.

Described from 3 females and 1 male reared at the type locality from *Leucopis atrifacies* Aldrich on Monterey pine, by Fred D. Bennett, June 20, 1958, and 1 male taken on foliage of Monterey pine at San Rafael, Marin Co., California, in June, 1958.

Lygocerus latifrons, new species

This species differs strikingly from the two species described above in its relatively much wider frons and its long malar space, which is much more than half as long as an eye.

Female.—Length 2 to 2.3 mm. Head more than twice as wide as long viewed from above; frons at narrowest point conspicuously wider than eye height and slightly concave below middle of eyes; frons and vertex finely granulose and mat; width of temple at narrowest point greater than length of antennal pedicel; antennae longer than head and thorax combined; scape extending far above level of vertex; first flagellar segment twice as long as pedicel and half as long as scape, much longer than any of the following segments, but all flagellar segments at least twice as long as broad.

Thorax stout but a little narrower than head; mesoscutum finely granular, three-fourths as long as wide; notaulices and

median groove sharply impressed and complete; scutellum flattened medially and finely granulose except at sides where it is more or less rugulose; mesopleuron coriaceous, shining. Abdomen at widest point slightly wider than thorax; petiole strongly longitudinally striate.

Black; antennae more or less brownish; wings clear hyaline, no fuscous cloud in anterior wing; legs largely yellowish brown, with coxae, femora and tibiae sometimes more or less piceous.

Male.—Like the female but with the frons even relatively wider, and with the antennae a little more slender and the scape much shorter. Unlike the male antennae of most species of *Lygocerus* those of this species do not have the basal flagellar segments serrate.

Type.—U. S. National Museum No. 64576.

Type-locality.—Escondido, CALIFORNIA.

Described from 6 females and 4 males reared from hemerobiid cocoons by D. W. Clancy in June, 1936.

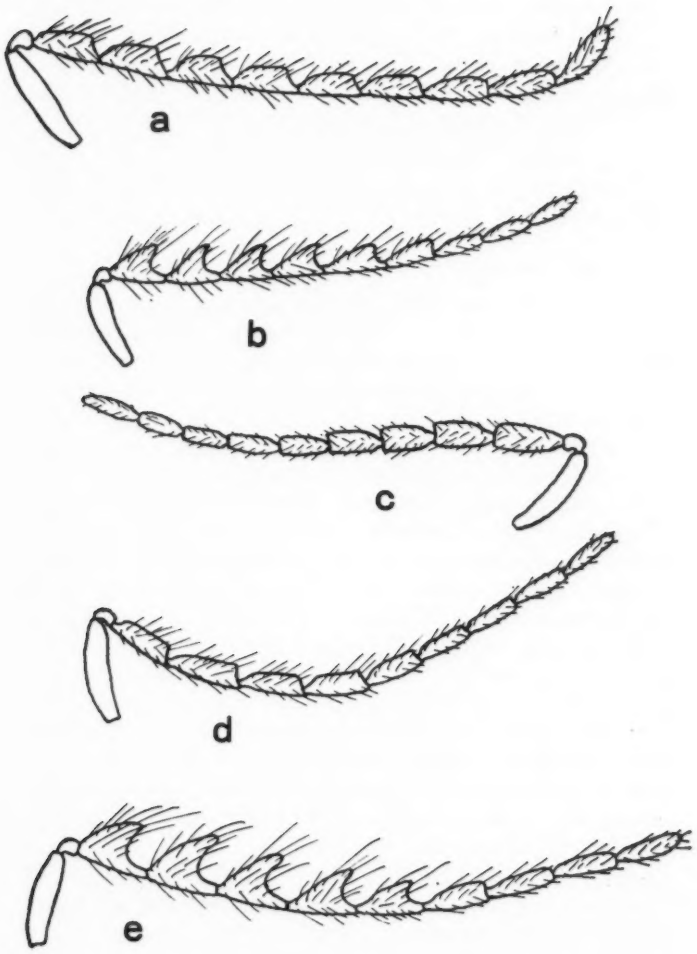
Lygocerus attentus, new species

In the structure of the female antennae and in the color of the legs this species resembles *floridanus* (Ashmead), but it differs widely in other respects, especially in the decidedly narrower frons, in the clouded anterior wing of the female, and in the more weakly serrate male antennae.

Female.—Length about 1.7 mm. Head seen from above more than twice as wide as long; frons at narrowest point not wider than eye height; frons and vertex coriaceous and subopaque; scape of antenna extending a little above vertex; first flagellar segment longer than pedicel or second flagellar segment; width of temple at narrowest point much less than length of pedicel.

Thorax slightly narrower than head; mesoscutum about twice as wide as long, with notaulices and median groove sharply impressed and complete; mesoscutum and scutellum coriaceous and subopaque; mesopleuron finely coriaceous and shining. Abdomen a little wider than thorax; base (petiole) of second tergite with short and coarse striae.

Black; base of scape brownish yellow; anterior wing with a conspicuous fuscous cloud across middle; legs yellowish brown,



Male antenna of: a, *Lycocerus attentus*, new species; b, *L. leucopidis*, new species; c, *L. latifrons*, new species; d, *L. incompletus*, new species, and e, *L. pinicola*, new species.

with coxae, hind femora and hind tibiae more or less blackish.

Male.—Antennae slender, flagellar segments 1 to 6 very weakly serrate; frons wider than eye height; all coxae, trochanters and femora black; otherwise essentially like the female.

Type.—U. S. National Museum No. 64577.

Type-locality.—Aroostook County, MAINE.

Described from 8 females and 3 males reared from *Macrosiphum solanifolii* (Ashmead) by W. A. Shands in 1953.

Lygocerus incompletus, new species

Distinguished from all described North American species by its incomplete notaulices. In that character it approaches *Dendrocerus* Ratzeburg, but in other details and in habitus it is like *Lygocerus* and I believe its correct placement is in this genus.

Female.—Length about 1.4 to 1.7 mm. Head twice as wide as long viewed from above; frons at narrowest point slightly wider than eye height; frons and vertex coriaceous and shining; width of temple at narrowest point much less than length of pedicel; scape of antenna extending noticeably above vertex; all flagellar segments at least twice as long as broad, the first and last the longest.

Mesoscutum and scutellum sculptured like frons; median groove of mesoscutum sharply impressed and complete; notaulices impressed only anteriorly, not attaining middle of mesoscutum; mesopleuron weakly coriaceous and shining. Abdomen wider than thorax; petiole with short and strong striae.

Black; antennal scape brownish yellow at extreme base; wings entirely clear hyaline; legs brownish yellow, with coxae, hind femora and hind tibiae more or less infuscated.

Male.—Antennae long and slender, basal flagellar segments weakly serrate; all femora somewhat infuscated; otherwise essentially like the female.

Type.—U. S. National Museum No. 64578.

Type-locality.—Aroostook County, MAINE.

Described from 26 females and 8 males reared from *Macrosiphum solanifolii* (Ashmead) by W. A. Shands in 1953.

The Neotropical Species of the Ant Genus Strumigenys Fr. Smith: Group of emeryi Mann (Hymenoptera)

By WILLIAM L. BROWN, JR., Museum of Comparative Zoology, Harvard University

This paper is a continuation of my series on the New World fauna of the dacetine ant genus *Strumigenys* Fr. Smith. Earlier parts, containing keys to the abbreviations for measurements and proportions, may be found in Jour. New York Ent. Soc. 61: 53–59, 101–110 (1953). In addition to these, other parts have been published or are being published in the same journal and in Studia Entomologica, Petropolis, Brazil. Figures of the species here described have been prepared, but are being reserved for a final summary with keys to the New World *Strumigenys,* to be published after the groups have all been dealt with.

The *emeryi* group includes a number of species intermediate between the *louisianae* group and the series of groups about *S. mandibularis* Fr. Smith. The species are more or less like *S. louisianae* Roger, but most of them are larger, with longer mandibles. Several of the species have oval pits, one in each lateral face of the propodeal lamellae, which may or may not be filled with a light-colored incrustation, probably representing a hardened secretion. I call these pits the *propodeal lacunae.* In *emeryi* and close relatives in this and adjacent groups, there is frequently present on each inner mandibular border a minute denticle, probably homologous with the proximal preapical tooth of species such as *mandibularis.* This denticle is often very difficult to see except at high magnifications in silhouette against a bright background; often the view must be oblique.

Strumigenys emeryi Mann

Strumigenys (*Strumigenys*) *emeryi* Mann, 1922, Proc. U. S. Nat. Mus. 61 (13): 37, fig. 18, worker, female. Type loc.: La Ceiba, Honduras, by present selection. Other orig. loc.: San Juan Pueblo, Honduras. Syntypes in USNM, MCZ.

Worker (6 syntypes, and 4 specimens representing the Mexican localities listed below): TL 2.6–2.9, HL 0.59–0.64, ML

0.38–0.40, WL 0.65–0.69, CI 80–82, MI 61–64. Resembling in general habitus *S. louisianae,* but larger, more elongate, and with different sculpture, pilosity and mandibular dentition.

Mandibles depressed, their insertions close together and the shafts parallel at full closure; external borders sharply drawn in at their bases. Inner borders straight to apical fifth, and then becoming slightly concave, with a small, acute preapical tooth set approximately its length or very slightly more away from the dorsal apical tooth, which is three or four times as long as the preapical tooth. Apical fork of two stout subequal spiniform teeth forming a broad U in which is set a single small triangular, acute intercalary denticle. Dorsal ridge of inner mandibular border with a minute proximal preapical denticle (occasionally broken off) at or near the apical third of the exposed mandibular length; this denticle best seen in silhouette against a bright white background; it was overlooked by Mann.

Antennal scapes (of three syntypes) similar to those of *elongata;* L 0.40–0.41; funiculus L 0.56–0.57; apical segment slightly longer than remainder of funiculus. Segment IV slightly longer than I and much longer than II plus III; II slightly longer than broad; III as broad as or slightly broader than long.

Pronotum with rounded anterior border, humeri not or only weakly subangulate, with small tubercles. Posterior half of dorsum of alitrunk weakly concave in profile; metanotal groove depressed only feebly. Propodeal teeth short, acute, moderately elevated and each subtended below by a concave translucent lamella that is slightly broadened ventrally, subangulate, with narrow lateral lacuna.

Petiole and postpetiole much as in *elongata,* but the disc of the postpetiole is less convex; petiole with a fairly well developed ventral spongiform strip. Both nodes also with luxuriant spongiform appendages otherwise. Postpetiolar disc with a cultrate border; its surface smooth and shining, with a few short, fine longitudinal costulae along its anterior margin. Basigastric costulae 10–14, usually occupying about $\frac{1}{5}$ or slightly less of the basal tergite.

Head with the usual punctulate sculpture, but this overlain by a stronger, more or less longitudinal rugulation on the dorsum posterior to the clypeus. Alitrunk with punctulation partly effaced, dorsum rather loosely and indefinitely longitudinally striato-rugulose, sides mostly smooth. Median carinula of promesonotum strong and distinct. Petiolar node rugulose loosely over punctulation. Mandibles, legs and antennae finely and densely punctulate-granulose.

Pilosity much as in *elongata,* but the cephalic ground hairs slightly smaller and less conspicuous. Flagellate hairs arranged as in *elongata,* but usually slightly finer. Dorsum of head with 2 pairs of stiffly erect clavate or narrowly spatulate hairs, the shorter pair on the vertex and the longer pair on the occiput as in *elongata;* ground hairs of alitrunk inconspicuous and few in number. Color variable. Types light to medium ferruginous, with gaster slightly darker. The Tehuantepec specimens are slightly larger, darker and less strongly rugulose. The Guerrero specimen is largest, very strongly rugulose, and its color is a very dark mahogany, approaching black, with mandibles and appendages ferruginous. Dark specimens of normally light-colored *Strumigenys* species often seem to come from moist upland areas, but the exact locality for the Guerrero specimen is unknown.

Female: I have seen no specimens of this caste, but Mann states that it has shorter mandibles than does the worker, and also thicker propodeal spines and coarser sculpture. Judging from his measurements of the workers, the length of the female in terms of the present TL would approach 3.0 mm. Male unknown.

Localities for material studied (in addition to the syntypes from Honduras): Mexico: St. Lucrecia, Tehuantepec (W. M. Mann). Laredo, Texas, from orchid plants originating in Guerrero (U. S. Plant Quarantine).

Strumigenys nevermanni new species

Holotype worker: TL 2.68, HL 0.61, ML 0.36, WL 0.67, CI 79, MI 59. Close to *emeryi,* but differing slightly in pro-

portions, in lacking a proximal preapical denticle on the mandible, and as follows:

(1) Propodeal teeth a little longer and more slender, about as long as the distance between the centers of their bases, with very narrow concave infradental lamellae bearing no appreciable lacunae on their outer faces.

(2) Head a bit less strongly, alitrunk more strongly, longitudinally rugulose, the rugulae spaced, regular and straight on the pronotum. Distinct median carinula extending onto mesonotum. Petiolar node densely punctulate, not strongly rugulose as in *emeryi,* and with distinctly less well developed spongiform appendages. Postpetiolar disc convex, shining, nearly smooth, with indistinct outlines of longitudinal striation appearing at high magnification. Only a part of the posterior sides and lower propodeal declivity of alitrunk smooth and shining.

Color ferruginous yellow, gaster more brownish.

Holotype, a worker selected from a type series of 8 workers and one dealate female, taken at Hondura, 1050 m. altitude, COSTA RICA (F. Nevermann leg.; deposited in USNM). Paratypes (from this series; USNM, MCZ), 7 workers: TL 2.59–2.82, HL 0.61–0.63, ML 0.36–0.38, CI 77–80, MI 58–60.

Dealate female *paratype:* TL 3.1, HL 0.63, ML 0.38, WL 0.77, CI 84, MI 60. Mesonotum rugulose, with a few erect tapered hairs. Known only from the type series.

Strumigenys micretes new species

Holotype worker: TL 2.99, HL 0.71, ML 0.45, WL 0.73, CI 72, MI 63. Close to *emeryi,* but larger, more slender and with narrower head. Also the following differences in detail from *emeryi:*

(1) Distal preapical tooth slightly smaller than that on mandible of *emeryi* (ca. $\frac{1}{4}$ as long as dorsal apical tooth), slender and very acute. Proximal preapical denticle extremely minute, difficult to see, distant from distal preapical tooth by not more than twice the length of the latter and situated at about the apical fifth of the ML.

(2) Dorsal borders of scrobes with a narrow laminar margin (present but vestigial in *emeryi*) having a slight bend or convexity at about the level of the eyes.

(3) Rugulation not quite as distinct as in most *emeryi* workers. Median carinula of alitrunk distinct, but weak anteriorly on pronotum. Postpetiolar dorsum with low, indistinct longitudinal striation, running its whole length, only weakly shining, subopaque in some lights. Lower half of sides of alitrunk, but not fore coxae, more or less smooth and shining; sculpture otherwise as in *emeryi*.

(4) Lacunae of propodeal lamellae larger and more distinct than in *emeryi*.

Color reddish ferruginous, gaster lightly infuscated; mandibles, antennae, legs and postpetiolar dorsum yellow.

Holotype from a nest series taken by W. M. Mann at Colombiana Farm, Santa Clara Province, COSTA RICA, in 1924 (USNM).

Paratype workers from the same series: TL 2.9–3.1, HL 0.70–0.74, ML 0.45–0.47, WL 0.72–0.76, CI 71–74, MI 62–65 (USNM, MCZ, Borgmeier Coll.).

A series received belatedly from the University of Michigan Museum of Zoology through the courtesy of Dr. Paul Kannowski was collected by F. M. Gaige at Progreso, Chiriqui Prov., Panama, April 15, 1923. These workers are slightly larger and have the mandibles a bit longer proportionately: HL 0.75–0.76, ML 0.50–0.51, MI 66–68. CI about as in the type series. Proximal denticle more remote from apex.

Strumigenys lacacoca new species

Holotype worker: TL 3.17, HL 0.75, ML 0.47, WL 0.75, CI 69, MI 62. Closely similar to *micretes*, but still more slender and with narrower head, and lacking preapical mandibular teeth or denticles of any kind. Other differences in detail, as compared to *micretes:*

(1) Propodeal teeth shorter, acute, involved to their apices in the infradental lamellae. Secretory lacunae in the sides of

the lamellae large and conspicuous, with shining bottoms (no secretion present in holotype or paratypes).

(2) Petiolar node with a rather abrupt anterodorsal angle falling off through a steep anterior slope; posterodorsal face straight in profile and gently sloping posteriad.

(3) Postpetiolar disc small, weakly convex, only very slightly broader than the petiolar node and broader than long; largely smooth and shining, but with weak longitudinal costulae along anterior border.

(4) Almost the entire sides of alitrunk smooth and shining, more extensively so than in *micretes*. Rugulation of head distinct. Basigastric costulae similar, but perhaps a bit longer.

(5) Pilosity basically as in *micretes*, but the two pairs of hairs on the verticocciput flagelliform instead of narrowly spatulate.

(6) Color ferruginous yellow, gaster slightly more brownish.

Holotype worker (in USNM) one of a series of 7 from the type nest series, taken by T. E. Snyder on the Rio Chinillo, PANAMA CANAL ZONE. The six *paratype* workers from this series (USNM, MCZ): TL 2.8–3.2, HL 0.70–0.75, ML 0.45–0.48, WL 0.72–0.75, CI 67–71, MI 60–66. Female and male not seen.

Because of its complete lack of mandibular preapical teeth, this species might be confused with *ludia* or other members of the *elongata* group, but the very different proportions of head and mandibles, different propodeal lamellae, and many other features will serve to separate *lacacoca* from such species.

The four species *emeryi, nevermanni, micretes* and *lacacoca* are very close, and seem, from the limited material available, to replace one another in a chain extending from Mexico to Panama, and perhaps beyond. So far as I can see now, the differences are complex enough and strong enough to indicate that each form is a distinct species, perhaps together one superspecies. However, it is also not beyond possibility that one or more of these forms intergrades with a neighbor. More material is needed.

Strumigenys boneti new species

Holotype worker: TL 2.1, HL 0.50, ML 0.30, WL 0.50 mm., CI 82, MI 60. In general habitus closely similar to smaller workers of *mixta,* but lacking the distal spiniform preapical tooth present in *mixta.* The minute denticle on the dorsal ridge of the inner mandibular border, however, is present and situated slightly basad of the apical third of the ML; this corresponds to the proximal denticle of *mixta* and *emeryi.* Apical fork of two approximately equal spiniform teeth, with an extremely small, inconspicuous intercalary tooth. Posteriorly, the occipital excision is rather broad and deep. Eyes not greatly reduced, moderately convex, visible from perfect full-face view of head. Scape L 0.32, funiculus 0.42 mm., size, shape and segmental proportions as in *mixta,* but scape perhaps very slightly more slender, with slender spatulate hairs forming a very regular row of 7 or 8 on the anterior border, all directed decumbently toward the apex.

As compared to *mixta,* the only other difference seen is in the paired lateral occipital, humeral and mesonotal hairs, which in *boneti* are rather short, stiffly erect and slender subclavate or truncate. On alitrunk, ground pilosity reduced to 6 or 8 very slender, short inconspicuous hairs, one small pair stiffly erect on the posterior mesonotum. Pilosity, sculpture, spongiform appendages, etc., otherwise identical to those of *mixta.*

Holotype, a unique worker taken in a Berlese funnel (Sample No. 1109) at Palmillas, Tabasco, Mexico, by Dr. Frederico Bonet, in MCZ.

Paratypes: A larger worker, but with shorter mandibles, from the ridge between Antiguo Morelos and Nuevo Morelos, Mexico (E. S. Ross leg.). TL 2.3, HL 0.56, ML 0.28, WL 0.57 mm.; CI 80, MI 50. Two workers, intermediate in size and proportions between the holotype and the Morelos paratype, from Cozumel, Quintana Roo, Mexico (L. J. Stannard leg.). Paratypes in California Academy of Science and MCZ.

I received the holotype specimen in 1949, and the basic description was composed at that time. Since *boneti* was so close

to *mixta,* it seemed best to hold the manuscript until further material might come to light. That material has now arrived in the form of the paratypes cited above, stemming from widely separated Mexican localities, and the diagnostic characters have remained consistent. *S. boneti* is obviously rather close to *mixta,* and may well have arisen directly from *mixta.* The retention of the proximal (submedian) mandibular denticle with the loss of the distal preapical tooth is rare in *Strumigenys,* and *boneti* is the only New World species so far shown to have this dentitional pattern.

Ichneumon canadensis Cress. Selection of New Lectotype

By Gerd H. Heinrich, Dryden, Maine

According to Cresson's original description (Trans. Ent. Soc. Phila., 1867, p. 308) the tibiae I and II of this species are yellow banded, the tibiae III yellow with black apex; the 3rd and 4th tergite have a black band at the base; the antennae are "short, joints thick set." The original description mentions four female specimens as material.

The present lectotype No. 940 of the species *Ichneumon canadensis* Cress. (designated in Mem. Amer. Ent. Soc., number 1, 1916) does not at all match the description. This specimen has reddish colored tibiae without any yellow tint, its tergites 3 and 4 are uniformly red without any black band and the antennae are long and slender. It therefore cannot be considered as the type.

The series of four paratypes in the Cresson collection is composed of 2 females belonging to yet another species, which does not match the original description and also 2 females which exactly match the description in every regard. I have selected one of the latter as the true lectotype of the species *Ichneumon canadensis* Cress.

Two New Typhlodromus from Florida. (Acarina: Phytoseiidae)

By Donald De Leon, Pensacola, North Carolina

The two species described below are of particular interest because the females are practically the same in appearance, but the males can be readily separated by their distinctive spermatophoral processes and by the different number of preanal setae. They belong to the species group with four pairs of anterior lateral setae and fit most closely the characterization of *T. cucumeris* Oud. as given by Chant (1958); they differ chiefly from the characterization of that species in that in the females the pair of pores on the ventrianal shield is in line with the posterior pair of preanals instead of being posterior of them, and in the males the ventrianal shield bears a pair of pores instead of lacking them.

All measurements are in microns. I have followed Evans (1957) in the use of metatarsus in place of basitarsus and, as in previous papers, the system suggested by Garman (1948) for distinguishing the setae of the dorsal shield.

Typhlodromus dentilis, n. sp.

Female: Dorsal shield imbricate, 295–329 long, 180–199 wide (five specimens) with nine lateral, two median and six dorsal pairs of setae. The lengths of these setae follow: L1 29, L2 19, L3 21, L4 29–34, L5 27, L6 27, L7 16, L8 13, L9 75 (pectinate); M1 13, M2 44 (pectinate); D1 24, D2 11, D3 13, D4 14–20, D5 20, D6 8. L1 and L4 are about as long as or somewhat longer than the distance between the bases of L1–L2 and L3–L4, respectively, L2 and L3 distinctly shorter than the distance to the seta next behind; the six setae of the dorsal hexagonal area shorter than the distance between their bases. S1 and S2 present. Peritremata extending forward to D1. Sternal shield with three pairs of setae; two pairs of metapodal shields, the primary one oval, 21 long and about 5.5 wide, the accessory linear, 10 long and about 2.5 wide. Ventrianal shield with three pairs of preanal setae and a pair of half-round pores be-

tween the posterior pair of preanals and in line with them or very slightly anterior of a line between them; ventrianal shield 109 long, 92 wide, practically pentagonal in shape, but widest by a small amount at about the middle pair of preanals and slightly constricted caudad beginning at a point about in line with the posterior pair of preanals; four pairs of interscutal setae including VL1 which is 47 long bordering ventrianal shield. Movable digit with three teeth; fixed digit with *pilus dentilis* and 10 teeth including the subapical tooth. Legs rather short and heavy; genua I–IV each with a macroseta 18, 15, 22, and 37 long, respectively; tibia IV and metatarsus each with a macroseta 18 and 61 long, respectively; all macrosetae slightly enlarged at tips.

MALE: Resembles female; dorsal shield 231–248 long, 144–163 wide (three specimens). Ventrianal shield with three pairs of preanals and a pair of pores. Spermatophore bearer roughly L-shaped with a large triangular process extending from "heel"; length of foot, including process, 23, length of shank 15. Fixed digit with *pilus dentilis* and with six teeth extending basad from subapical tooth, the first tooth about half the height of the others; subapical tooth greatly enlarged, the terminal hook (or tooth) appearing merely as a small spur.

Holotype: Male, Miami, FLORIDA, May 24, 1956 (D. De Leon), from *Rhus copallina. Paratypes:* four females, same data as for holotype; two males, two females, S. Miami, Fla., November 24, 1954 from *Centradenia* sp.; one male, one female, Ft. Lauderdale, Fla., October 23, 1954, from *Jussiaea peruviana;* one male, Key Largo, Fla., September 27, 1958, from *Callicarpa americana.*

Typhlodromus dillus, n. sp.

The male of *T. dillus* can be most readily distinguished from the male of *T. dentilis* by the foot of the spermatophore bearer being about as long as the shank, the heel lacking the triangular shaped process, and by the ventrianal shield having four pairs of preanal setae. The ventrianal shield of the female has the

sides practically straight or slightly bowed out whereas in *dentilis* the sides bend in slightly.

FEMALE: Dorsal shield imbricate, 294–315 long, 168–188 wide (five specimens) with nine lateral, two median, and six dorsal pairs of setae. The lengths of these setae follow: L1 18–26, L2 14–18, L3 12–19, L4 18–31, L5 14–24, L6 17–24, L7 14–21, L8 14–18, L9 63–73 (pectinate); M1 9–15, M2 33–47 (pectinate); D1 18–26, D2 14–18, D3 10–14, D4 11–17, D5 10–20, D6 10. S1 and S2 present. L1 and L4 are somewhat shorter to about as long as the distance between the bases of L1–L2 and L3–L4, respectively; L2 and L3 are distinctly shorter than the distance to the base of the seta next behind; the six setae of the dorsal hexagonal area are shorter than the distance between their bases. Peritremata extending forward about to D1. Sternal shield with three pairs of setae; two pairs of metapodal shields, the primary one unevenly oval, 17 long, about 5.5 wide, the accessory linear, 9 long, about 2.5 wide. Ventrianal shield 108 long, 92 wide with three pairs of preanal setae and a pair of half-round pores between and in line with the posterior pair of preanals; ventrianal shield bordered by four pairs of interscutal setae including VL1 which is 40–45 long. Movable digit with three teeth; fixed digit with *pilus dentilis* and nine teeth including the subapical tooth. Legs rather short and heavy; genua I–IV each with a macroseta 16, 14, 19, and 24–36 long, respectively; tibia IV and metatarsus each with a macroseta 10–16 and 40–51 long, respectively; all macrosetae slightly enlarged at tips.

MALE: Resembles female; dorsal shield 252 long, 147 wide. Ventrianal shield with four pairs of preanal setae and a pair of pores. Spermatophore bearer roughly L-shaped, the foot about 10 long with a small more or less laterally directed process near the middle, the shank about 13 long and rather thick. Movable digit with one tooth, fixed digit with six teeth basad of subapical tooth which is about the size of the terminal hook.

Holotype: Male, Barwell, FLORIDA, September 1, 1956 (D. De Leon), from *Hicoria* sp. *Paratypes:* three males, four females, other data as for holotype; one female, Fellowship, Fla., September 1, 1956, from *Zanthoxylum clava-herculis;* one male

and one female, Branford, Fla., September 1, 1956 from *Quercus* sp. Additional specimens were collected at Columbus, Ga., August, 1956, from alder and from red maple.

Types of the above two species are in the author's collection; paratypes will be deposited in the University of Florida Collections, Gainesville.

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Eucerceris simulatrix Viereck & Cockerell Misspelled on Type Label

By H. A. SCULLEN

On a recent visit to the Academy of Natural Sciences of Philadelphia (Sept. 29, 1958) the writer discovered Type No. 10396 was labeled *Eucerceris simulator* Viereck & Cockerell. This was one of a series of type labels placed on specimens by E. T. Cresson, Jr. As no *E. simulator* was ever described a careful check was made with the original description of *E. simulatrix* Viereck & Cockerell (Jour. N. Y. Ent. Soc., XII: 87, 1904). The above specimen was found to agree with the original description of *E. simulatrix*. I, therefore, consider the above specimen to be the Holotype of *Eucerceris simulatrix* Viereck & Cockerell and have so corrected the label. The species was described from a single specimen.

As indicated in my 1939 review of the genus *Eucerceris* (Oreg. State Monog., Studies in Ent., No. 1, p. 28) *E. simulatrix* V. & C. is a synonym of *E. fulvipes* Cresson.

Further Notes on the Genus Gesonula (Orthoptera; Acrididae; Cyrtacanthacridinae)

By James A. G. Rehn, Curator of Insects, Academy of Natural Sciences of Philadelphia

A few years past the author assembled a considerable amount of information on the forms of this genus,[1] and demonstrated that it was made up of two species, one of them—*G. punctifrons*—being southeast Asian in distribution, the other—*mundata*—with a broad range from northern Thailand through the Sunda Islands to New Guinea, the Solomon Islands and northern Australia, and north at least to the Philippines. Previous records of the genus from Formosa (Taiwan) and the Ryukyu Islands could not then be placed specifically, as material from those areas was not available.

Since the above mentioned paper was published additional material of the genus has become available, some belonging to the Museum of Comparative Zoology, at Cambridge, Mass., some to the California Academy of Sciences, at San Francisco, Cal., and also a few specimens in our Academy series which had been overlooked previously. The information supplied by these small but important representations is of particular value as it fixes the relationship of Formosan and Ryukyu populations and also shows that south Thailand possesses the same member of the genus as the more northern portion of the same country, that the *Gesonula* of this area as a whole is Indonesian and not continental Asian in relationship, and further that Lower Burma individuals show the same Indonesian affinity. While previously I knew the north Thailand material was of the *mundata* stock, I then lacked any representation from the Bangkok area, which, fortunately, is now available.

A key to the forms of the genus, and ample discussion of the species and subspecies have been presented in the earlier paper, and the present contribution is largely of supplementary, chiefly geographic, information.

[1] "On the Genus Gesonula," Trans. Amer. Entom. Soc., LXXVIII, pp. 117–136, pl. V, (1952).

Gesonula punctifrons (Stål)

CHINA: Hangchow, Chekiang Province; V, 25, 1923; (E. C. Van Dyke); 1 ♀; [Cal. Acad. of Sci.]. Cheng-tu, Szechuan Province; (Crampton); 1 ♀; [M.C.Z.].

Gesonula mundata laosana Rehn

BURMA: Toungoo; (A. V. B. Crumb); 1 ♀; [A.N.S.P.]. THAILAND: Bangkok; III, 3, 1928; (R. M. de Schauensee); 5 ♂, 3 ♀; [A.N.S.P.].

This material demonstrates that *mundata,* and this one of its component subspecies, is the representative of the genus found in lower Thailand, as well as the more northern, more montane, portion of the country, and also in Lower Burma, although the broadly distributed continental Asian *G. punctifrons* is the generic representative in the mountainous areas of northern Burma, as well as in Assam.

Gesonula mundata sanguinolenta (Krauss)

NEW GUINEA: Finschafen; V, 10, 1944; (E. S. Ross); 1 ♂; [Cal. Acad. Sci.]. Roon Island; (Thomas Barbour); 1 ♂; [M.C.Z.].
SOLOMON ISLANDS: Fulakora, Santa Isabel Island; (W. M. Mann); 1 ♀; [M.C.Z.].

Gesonula mundata zonocera (Navas)

It is now clearly evident that *Racilia okinawensis* Shiraki (1910, Acrid. Japans., p. 58), based on material from Okinawa, Ryukyu Islands and Formosa, is inseparable from Navas *zonocera,* proposed six years earlier, on the basis of Philippine material. This point I was unable to solve in my earlier study.

PHILIPPINES: 10 ms. E. of Olongapo, Bataan Province, Luzon, elev. 1200 ft.; V, 1907; (J. C. Thompson); 3 ♀; [Cal. Acad. Sci. and A.N.S.P.]. Carayrayan, Baco, Mindoro;[2] XII; (Pedro de Mesa); 2 ♂, 3 ♀; [M.C.Z. and A.N.S.P.].

[2] I have been unable to place this locality, either in the index of geographic names or on the detailed map of Mindoro (facing p. 190) in the comprehensive 1918 Philippine Census volume (published in 1920).

FORMOSA [TAIWAN]: Karenko; IV, 23, 1932; (L. Gressitt); 1 ♀; [M.C.Z.]. Rokki; V, 26, 1934; (L. Gressitt); 1 ♂; [M.C.Z.].

RYUKYU ISLANDS: Iriomote Island; VIII, 19, 1934; (L. Gressitt); 1 ♀; [M.C.Z.].

Gesonula mundata subsp.?

I have also seen two female specimens of the genus taken at Piru, Ceram in 1906–1907 by Thomas Barbour, and from the Museum of Comparative Zoology collection. They have been dried from alcohol and in consequence, except that they represent *G. mundata,* it is not possible to allocate them more definitely. However, in their longer alar organs they show a closer approach to *G. m. sanguinolenta* of New Guinea than to *G. m. pulchra* of the Greater Sunda Islands.

In a recent "Synopsis of the Acridoidea of the Indo-Malayan and Adjacent Regions" Willemse [3] has failed to clarify the distribution of *Gesonula punctifrons,* and continues to include in its distributional area localities in the Philippines, and Java, which regions were shown in my study of 1952 to possess members of the *mundata* line of the genus, and not of the *punctifrons* one, which is, as far as known, entirely continental Asian in its occurrence. The information here presented shows also that in southern Thailand the representative of the genus is *G. mundata laosana,* and not *G. punctifrons* as given by Willemse. Further I cannot help but question his records of *G. mundata mundata* from New Guinea, New Pomerania and the Aru Islands, as these records probably relate to *G. mundata sanguinolenta,* which is the form of that species found in New Guinea and the Solomon Islands, and which had the Aru Islands as one of its original localities. The present records increase to 231 the number of specimens of the genus personally studied, these from a total of 54 localities.

[3] Publicaties Naturh. Genootschap Limburg, VIII, p. 162, (1955).

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale or services rendered. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and, only when necessary those at the top (being longest in) are discontinued.

Conopidae of the World wanted. Will pay 10¢ to $1.00 for pinned and labelled specimens. S. Camras, 4407 N. Milwaukee Ave., Chicago 30, Illinois.

Anisoptera—Nearctic sp. wanted for exchange, espec. Ophiog., Arigom., Aeschna, Neurocor., Somatoc., Cordulia, Dorocor., Leucor. R. D. Cuyler, Dept. of Entomology, N. C. State College, Raleigh, N. C.

Bembicini and Stizini (Hym., Sphec.) of New World wanted for revis. study. Will return upon request or at end of project. James E. Gillaspy, Dept. of Zoology, Univ. Texas, Austin 12, Texas.

Agapema galbina. Will exchange cocoons of this moth for nature books. E. Frizzell, Route 4, Box 96, San Benito, Texas.

Tenebrionidae of the World wanted, in exchange for insects of Argentina and neighboring countries. Horacio J. Molinari, Av. Lib. Gral. San Martin 55, Acassuso (Buenos Aires), Rep. Argentina.

Butterflies. Wish to exchange specimens for Japanese species. Please write to Ichiro Nakamura (Boy, age 16), 26 Aza-Nichiyama Obayashi Takarazuka-shi, Hyogo-Ken, Japan.

Phasmidae of nearctic area desired alive. Purchase or trade, drawing on large stock of major orders, worldwide. Domminck J. Pirone, Dept. Entomology, Cornell University, Ithaca, N. Y.

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A TAXONOMIC STUDY OF THE NORTH AMERICAN LICININI WITH NOTES ON THE OLD WORLD SPECIES OF THE GENUS DIPLOCHEILA BRULLE (COLEOPTERA)

By George E. Ball

258 pages of text, 75 tables, 3 diagrams, 15 plates, table of contents and index

This monograph considers the geographical variation, relationships, evolution and taxonomy of the carabid tribe Licinini. A general treatment, explaining the taxonomic approach used, definition of terms, criteria for delimiting species and subspecies, etc., precedes the systematic position. The genera *Diplocheila* (subgenera *Diplocheila, Neorembus, Isorembus*), *Dicaelus* (subgenera *Paradicaelus, Dicaelus, Liodicaelus*) and *Badister* (subgenera *Badister, Trimorphus, Baudia*) are each treated in some detail. Keys to the genera and species are given throughout as well as a description (or diagnostic notes), variation, distribution and frequently locality records for each of the forms treated. The phylogeny and zoogeography of each genus are discussed in a separate section. Variation of mensurable characters is treated in the 75 tables. Fifteen plates depict structural (including genitalia) and variational features of the species discussed.

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